Paper No. 23

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte PETER R. STRUTT, BERNARD H. KEAR
and ROSS F. BOLAND

Appeal No. 2002-0928
Application 09/315,251[1]

ON BRIEF

Before METZ, WARREN and PAWLIKOWSKI, *Administrative Patent Judges.*

METZ, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the examiner's refusal to allow claims 1 through 5 and 8 through 12, which are all the claims remaining in the application. The finally rejected claims were 1 through 6 and 8 through 12 but appellants filed an amendment with their brief which, *inter alia*, canceled claim 6. The

[1] Application for patent filed May 20, 1999. According to the official records of the Patent and Trademark Office (PTO), this application is a division of application Serial Number 09/019,061, filed on February 5, 1998, and now U.S. Patent Number 6,025,034, which issued on February 15, 2000, which is a continuation of application Serial Number 08558,133, filed on November 13, 1995, and now abandoned.

examiner

has indicated in her answer that the amendment has been entered. Accordingly, the subject matter of canceled claim 6 no longer forms any issue in this appeal.

THE INVENTION

The appealed subject matter is directed to a method for forming a "nanostructured" coating comprising three recited steps. In the first step a "nanostructured" material is dispersed in a liquid medium using ultrasound to form a solution having dispersed therein "nanostructured" particles ranging in size from 3 to 30 nanometers (**nm**)[2]. In the second step, the dispersion obtained in the first step is injected directly into the feed of a thermal spray apparatus. Finally, the dispersion is sprayed onto an article to form a "nanostructured" coating on said article. According to appellants, their method allows reproducible deposition of high-quality "nanostructured" coatings without an intermediate re-processing step and allows the constituents to be mixed at a molecular level.

We are told by appellants at page 1 of their specification at lines 14 through 18 that:

> Nanostructured materials are characterized by having a high fraction of the material's atoms residing at grain or particle boundaries. For example, with a grain size in the five

[2] A nanometer is 10^{-9} meters or 1/1000 (one thousandth) of a micron.

> nanometer range, about one-half of the atoms in a nanocrystalline or a nanophase solid reside at grain or particle interfaces.

Claim 1 is believed to be adequately representative of the appealed subject matter and is reproduced below for a more facile understanding of the claimed invention:

> Claim 1. A method for forming a nanostructured coating, comprising
>
> dispersing a nanostructured material in a liquid medium by ultrasound to form a solution having dispersed therein nanostructured particles having particle sizes in the range of from 3 to 30 nanometers;
>
> injecting the solution directly into the feed of a thermal spray apparatus; and
>
> spray coating the solution onto an article to form a nanostructured coating on the article.

THE REFERENCES

The references of record which are being relied on by the examiner as evidence of obviousness are:

Ozaki et al. (Ozaki)	4,746,468	May 24, 1988
Gitzhofer et al. (Gitzhofer)	5,609,921	March 11, 1997

THE REJECTION

Claims 1 through 5 and 8 through 12 stand rejected as being unpatentable under 35 U.S.C. § 103 as the subject matter therein claimed would have been obvious to a person of ordinary skill in this art at the time appellants made their invention.

OPINION

We begin by determining the scope and content of appellants'

claims because it is the claims which define the protection for which appellants seek a patent. United Carbon Co. v. Binney & Smith Co., 317 U.S. 228, 232, 55 USPQ 381, 383-384 (1942) (citing General Electric Co. v. Wabash Appliance Corp., 304 U.S. 364, 369, 37 USPQ 466, 468-469 (1938); In re Zletz, 893 F.2d 319, 321, 322, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989); SRI Int'l. v. Matsushita Elec. Corp., 775 F.2d 1107, 1121, 227 USPQ 577, 586 (Fed. Cir. 1985) (en banc).

The claimed method is one "for forming a nanostructured coating." The terminology "nanostructured coating" as it would have been understood by a person of ordinary skill in the art at the time appellants made their invention and as defined by appellants at page 1 of their specification denotes more than a mere particle size. The terminology suggests a particular structure at the atomic or molecular level for the coating obtained by the claimed method. Thus, we interpret claim 1 as a method which requires that the coating obtained have a particular structure and a particular size, that is, on the order of a nanometer.

The steps recited in claim 1, except for the use of ultrasound to form a solution having dispersed therein nanostructured particles, read on what appear to be the conventional steps used in the prior art methods of spray drying or plasma spraying to form coatings. Nevertheless, claim 1 requires that the coating obtained by the recited steps possess a nanostructure and claim 1 also requires dispersing nanostructured materials in the liquid to be

thermally sprayed. Appellants' claim 1 does not recite any particular "liquid medium" or any particular "nanostructured material" for use in their method.

As the examiner admits at page 4 of her answer, Gitzhofer does not disclose: (1) ultrasound dispersion; (2) the particle size required for the nanostructured particles; or, (3) the nanostructured materials. Indeed, Gitzhofer is not directed to the formation of nanostructured coatings but only to coatings of "small particles" of undefined size or character. What Gitzhofer means by small is not entirely clear from their disclosure but at column 5, lines 26 through 30 it is disclosed that the rate of deposition using Gitzhofer's method is as high as 20 μm per minute. Thus, it appears that the most reasonable interpretation of Gitzhofer is that they use particles with sizes on the order of microns and obtain coatings several microns thick. Gitzhofer improves the properties of the coating by preparing the particles to be coated as a dispersion in a liquid or semi-liquid carrier rather than injecting the particles into the plasma flow as a powder.

Ozaki is directed to preparing ceramic microspheres wherein ceramic powders are dispersed in water using ultrasound to form a suspension and the therein obtained suspension dispersed in a high boiling liquid as droplets. As the water is removed the dispersed suspension in said high boiling liquid begins to form spherical particles. After water is removed, the high boiling liquid

containing the spherical particles is filtered to recover the spherical particles and the spherical particles are thereafter sintered at from 1000°C to 1300°C. In Example 1, zirconium oxide having a particle size of 0.005 μm (5 nanometers) was added to water with a surface active agent and was dispersed using ultrasound. Polyvinyl alcohol (PVA) was subsequently added to the zirconium oxide/surface active agent mixture forming a suspension. The suspension was dropped into a high boiling liquid and allowed to disperse and the suspension transformed into spherical particles. Water was removed resulting in zirconium oxide/PVA microspheres. The zirconium oxide/PVA microspheres were sintered at 1000°C to obtain zirconium oxide microspheres which were shown under an electron microscope to have a particle size of about 50 μm.

The examiner concludes that it would have been obvious to have used ultrasound in Gitzhofer to provide therein a more uniform dispersion because both references deal with small particles and Gitzhofer teaches the desirability of preventing agglomeration. The examiner reasons that because the terminology "small particles" in Gitzhofer would include micron and nanometer size particles and because Ozaki discloses 5 nanometer sized particles, the references are properly combined. We disagree.

In the first instance, the claimed method requires more than a particular particle size. The claimed method also requires a

particular structure, that is, a nanostructure or one characterized by "a high fraction of the material's atoms residing at grain or particle boundaries." This is not shown by either Gitzhofer or Ozaki. There is logic behind the examiner's argument that because Gitzhofer discloses laying down a layer having a thickness of "a few hundred microns" by successive laydown of individual droplets it would have been expected that the droplets would be smaller than the layer. Nonetheless, there is no evidence which supports the examiner's ultimate conclusion that the droplets would be in the nanometer range (three orders of magnitude smaller than a layer of 1 micron). Nothing in Gitzhofer suggests the layer are nanostructured materials. The examiner's argument that appellants have not established that "small" would not mean nanometer or even that it would have been understood to mean micron misses the point: it is the examiner's burden to establish by substantial evidence the various elements required by appellants' claims. On this record, the examiner has not carried her burden of persuasion.

Further, while we agree with the examiner that Ozaki is evidence that ultrasound is a conventional expedient for preparing dispersions of solids in liquids, appellants process is more than simply the use of ultrasound for preparing dispersions of solids in liquids. We reiterate that we have interpreted the claimed method as requiring the dispersion of nanostructured materials in a liquid using ultrasound to obtain a dispersion of nanostructured

particles. While Ozaki prepares a dispersion of zirconium oxide having a particle size of 5 nanometers in water using ultrasound, there is no evidence in the record which establishes that zirconium oxide of 5 nanometer particle size as dispersed by ultrasound is a "nanostructured material." Moreover, the dispersion obtained by Ozaki is subsequently dropped into a high boiling liquid to drive off water and form microspheres which ultimately have a particle size of "about 50 μm." The examiner has not adequately explained why the routineer would have halted Ozaki's process after forming the aqueous dispersion of zirconium oxide by ultrasound and then used the dispersion in Gitzhofer's process for a different purpose than that intended by Ozaki for their process. Accordingly, we find that the examiner has failed to make out a *prima facie* case of obviousness for the subject matter appellants claim to be their invention. Because we have found the examiner has failed to make out a *prima facie* case of obviousness, it is unnecessary for our decision to address the declarations under 37 C.F.R. § 1.132 which represent appellants' evidence of non-obviousness.

NEW GROUND OF REJECTION

Pursuant to our authority under 37 C.F.R. § 1.196(b), we enter the following new ground of rejection. Claims 1 through 5 and 8 through 12 are rejected under the judicially created doctrine of obviousness-type double patenting over the claims in U.S. Patent Number 6,025,034.

We observe that this application is stated to be a division of application Serial Number 09/019,061 which has issued to U.S. Patent Number 6,025,034. Claim 1 in that patent is directed to a method for producing a nanostructure by steps which include the steps recited in appealed claim 1. The method in the patent further requires adding an organic binder to the liquid medium in which the nanostructured material is dispersed, a step which is not excluded by the method of claim 1 here. Additionally, claim 1 of the patent is specifically directed to spray-drying while claim 1 here is generic to "injecting the solution directly into the feed of a thermal spray apparatus" which includes spray-drying.

The nanostructured materials of claim 2 are set forth in claim 3 of the patent. The materials claimed in claims 3 and 4 are set forth in claim 4 of the patent. The materials claimed in claim 5 are disclosed at column 8, lines 6 through 13 of the patent and are included by claim 1 of the patent which recites a method "comprising" various steps. The method of claims 8 through 12 of this application require two cycles of the process of claim 1 wherein two layers of nanostructured materials are coated on a substrate. Obviously, claim 1 of the patent may be repeated to obtain coatings of two or more nanostructured materials on a substrate. See column 7, line 61 through column 8, line 13 of the patent.

Notwithstanding the current patent term provisions of 35

U.S.C. § 154, the policy rationale for the judicially created doctrine of obviousness-type double patenting remains intact. Accordingly, appellants must file the requisite terminal disclaimer of their patent in order to overcome this rejection.

SUMMARY

The rejection of claims 1 through 5 and 8 through 12 under 35 U.S.C. § 103, is **reversed**. We have made a new ground of rejection under 37 C.F.R. § 1.196(b).

This decision contains a new ground of rejection pursuant to 37 C.F.R. § 1.196(b) (amended effective Dec. 1, 1997, by final rule notice, 62 Fed. Reg. 53,131, 53,197 (Oct. 10, 1997), 1203 Off. Gaz. Pat. & Trademark Office 63, 122 (Oct. 21, 1997)). 37 C.F.R. § 1.196(b) provides that, "A new ground of rejection shall not be considered final for purposes of judicial review."

37 C.F.R. § 1.196(b) also provides that the appellant, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of proceedings (§ 1.197(c)) as to the rejected claims:

> (1) Submit an appropriate amendment of the claims so rejected or a showing of facts relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the application will be remanded to the examiner. . . .
>
> (2) Request that the application be reheard under § 1.197(b) by the Board of Patent Appeals and Interferences upon the same record. . . .

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

REVERSED
37 C.F.R 1.196(b)

ANDREW H. METZ Administrative Patent Judge	)
CHARLES F. WARREN Administrative Patent Judge	) BOARD OF PATENT APPEALS AND INTERFERENCES
BEVERLY A. PAWLIKOWSKI Administrative Patent Judge	)

AHM/gjh

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